

LONGER STROKES, HIGHER FORCES WITH TROMBETTA'S HEAVY DUTY P/Q500 SERIES

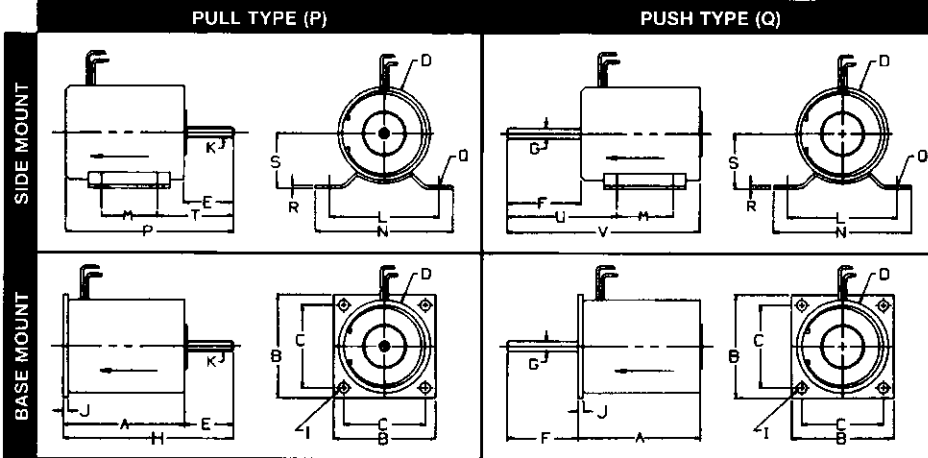
Trombetta
P/Q500 SERIES
Solenoids

P/Q500 Features/Applications

Trombetta's workhorse P/Q500 Series solenoids tame tough-duty industrial applications with higher forces, longer strokes and special construction.

- Efficient tubular design for higher forces at lower power input.
- High temperature coil insulation standard.
- 100% factory inspected and tested.
- Choose from 5 standard models, or specify custom designs.
- Wide range of wattage coils offered for each standard voltage.
- Can be used in AC applications with Trombetta's S500 module.
- Many options available for customized installations.

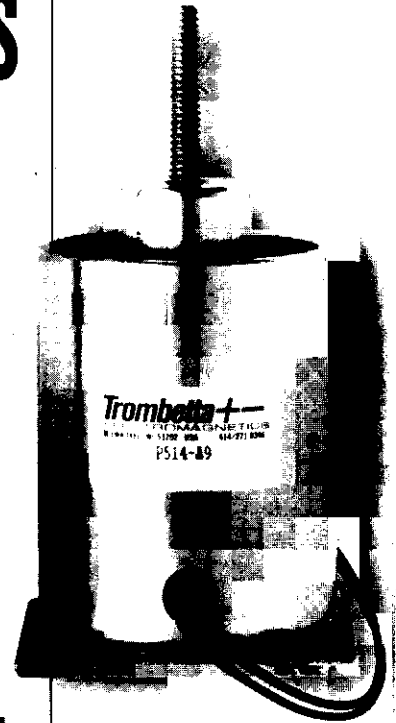
P/Q500 Series Dimension Table



DIMENSIONS

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V
510	2 ⁷ / ₃₂	1 ³ / ₄	1 ¹ / ₁₆	1 ⁵ / ₈	1	1 ¹ / ₄	3 ⁷ / ₁₆	3 ⁷ / ₃₂	5 ¹ / ₃₂	3 ¹ / ₃₂	10-24	2 ¹ / ₈	1 ⁹ / ₃₂	2 ⁵ / ₈	3 ¹ / ₈	1 ¹³ / ₆₄	1 ¹ / ₁₆	7 ¹ / ₈	1 ¹¹ / ₃₂	1 ³ / ₄	3 ³ / ₈
514	3	2 ¹ / ₂	2	2 ¹ / ₄	1 ¹ / ₄	1 ³ / ₄	1 ¹ / ₄	4 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₈	1/4-20	2 ¹ / ₁₆	1 ³ / ₈	3 ³ / ₈	4 ¹ / ₈	9 ¹ / ₃₂	5 ¹ / ₆₄	1 ⁵ / ₁₆	2 ¹ / ₈	2 ³ / ₈	4 ³ / ₈
515	3 ⁵ / ₈	2 ⁷ / ₈	2 ³ / ₈	2 ⁵ / ₈	1 ¹ / ₂	2 ¹ / ₄	1 ¹ / ₄	5 ¹ / ₈	9 ¹ / ₃₂	1 ¹ / ₈	1/4-20	3 ¹ / ₁₆	1 ³ / ₄	3 ⁷ / ₈	5	3 ³ / ₈	7 ¹ / ₃₂	1 ⁷ / ₁₆	2 ³ / ₈	3 ¹ / ₈	5 ³ / ₄
516	4 ⁹ / ₃₂	3 ¹ / ₄	2 ³ / ₈	3	1 ³ / ₄	2 ³ / ₄	3 ¹ / ₈	6 ¹ / ₃₂	9 ¹ / ₃₂	3 ¹ / ₃₂	3/8-16	3 ³ / ₈	2 ¹ / ₄	4 ³ / ₈	5 ⁷ / ₈	1 ¹¹ / ₃₂	3 ¹ / ₁₆	1 ¹ / ₁₆	2 ¹ / ₁₆	3 ¹ / ₁₆	6 ¹ / ₈
517	5 ¹ / ₃₂	3 ³ / ₄	3 ¹ / ₁₆	3 ¹ / ₂	2 ¹ / ₄	3 ¹ / ₄	3 ¹ / ₈	7 ³ / ₃₂	1 ¹¹ / ₃₂	5 ¹ / ₃₂	3/8-16	4	2 ³ / ₄	4 ⁷ / ₈	7 ¹ / ₈	1 ¹¹ / ₃₂	1 ¹ / ₄	2	3 ¹ / ₂	4 ¹ / ₈	8 ¹ / ₈

The above dimensions are in inches.



Trombetta solenoid products have been designed and manufactured in the U.S.A. since 1932.

See Trombetta first for long-lasting tough-duty solenoids to fit the toughest — or easiest — applications.



HUEGLI TECH LTD
SWITZERLAND

Tel.: +41-62-916 50 30
Fax: +41-62-916 50 35
sales@huegli-tech.com

Trombetta 
MOTION TECHNOLOGIES

Trombetta P/Q500 SERIES Solenoids

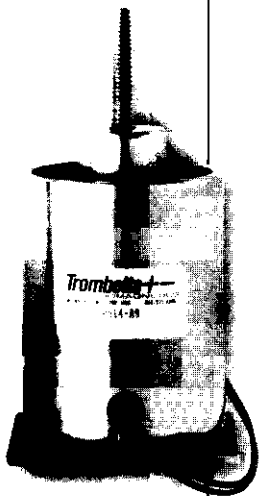


FIGURE 1 is an overview of the five P/Q500 sizes. The higher your force requirement, the larger the solenoid. Also, if you need a rapid cycle rate, you may need to select the next larger size solenoid in order to dissipate the Average Power put into the unit. The longer your stroke is, the larger the solenoid has to be. Sizes range from the smaller 510 up to the 517.

FIGURE 2 is a guide for considering any current limitations of your electrical system. Generally, an automotive 12 VDC system can deliver a pulse of 100 Amps, and a typical 120 VAC, 20 Amp circuit could be pulsed to 100 Amps, but the control switch to the solenoid must limit the ON Time. In the event the control switch fails (sticks on), you should consider any unsafe conditions. This failure mode can usually be covered by proper fusing or selecting the right circuit breaker. When using the AC line, remember that these are DC solenoids and either 'Full Wave' or 'Half Wave' rectification can be used. 'Straight Line DC' is also an adequate source. If possible, we recommend that the control switch be located on the AC side of any rectification.

With the lowest choice of wattage available for a given size solenoid, we rate it at *Continuous Duty*, meaning power can be applied indefinitely. The drawback is these coils don't produce a lot of force; but once the armature (plunger) is seated, they hold efficiently. The other option to get the best *Pulse Duty Pull-in* force and *Continuous Duty Hold-in* force is a *Dual Section* coil winding. The same effect can also be accomplished with a *Single Section* winding if a Trombetta Solid State Control is used as the control switch.

Determining Solenoid Performance

Trombetta has extensively tested the P/Q500 Solenoid line for Electromechanical & Temperature Performance. The data shown should be considered as Typical. Please use this information as a guide and consult Trombetta with details about your application.

FIGURE 1 P/Q 500 Series Solenoids - Selector Guide
for 25 °C Pulse Duty Coils

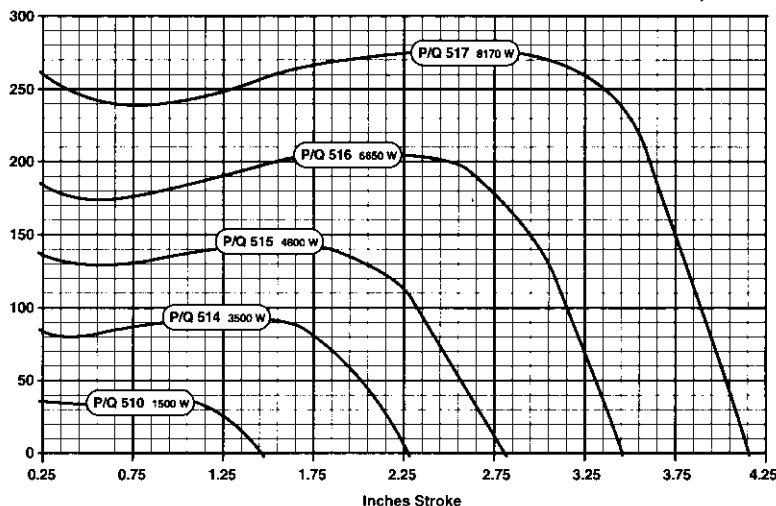


FIGURE 2 Current Draw Based on Coil Voltage and Wattage
(Applies to all sizes of DC solenoids. Watts = Volts x Amps.)

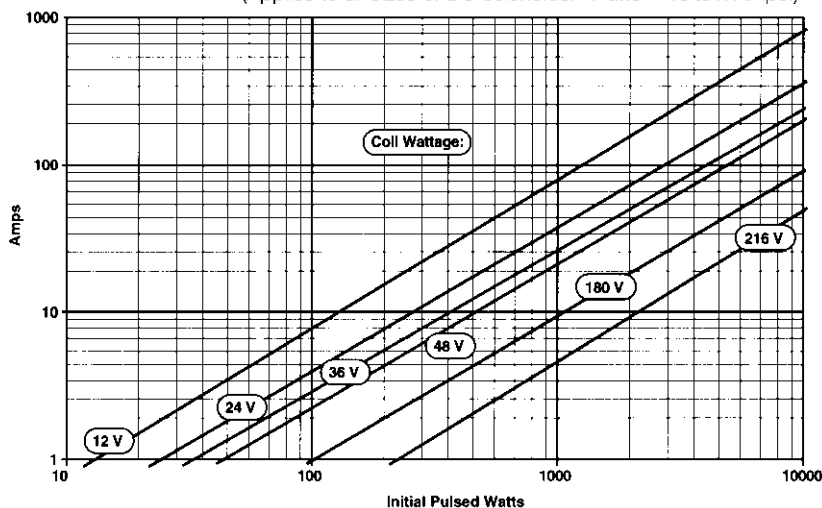


FIGURE 3 P/Q 500 Series Solenoids - Power Derating Curves
Maximum Allowed Average Input Power for a 155 °C Coil

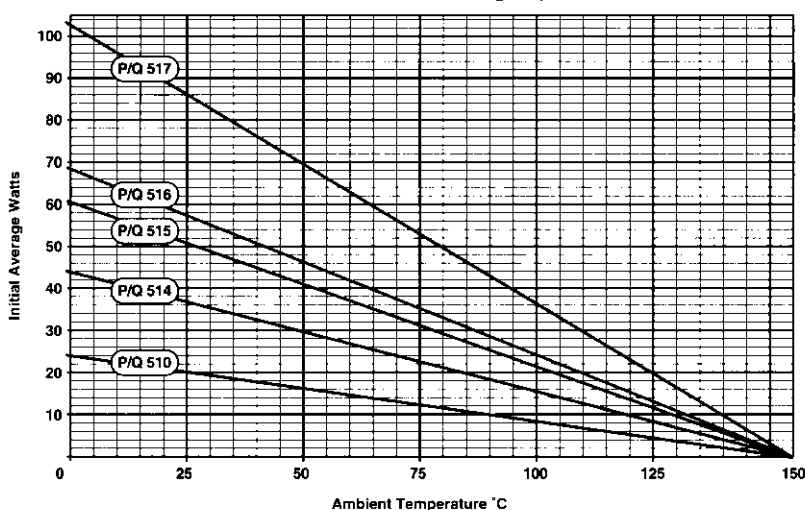


FIGURE 4 P/Q 500 Series Solenoids - Maximum Non-Repetitive ON Time
In a 25 °C Ambient, before DAMAGE occurs to the solenoid.

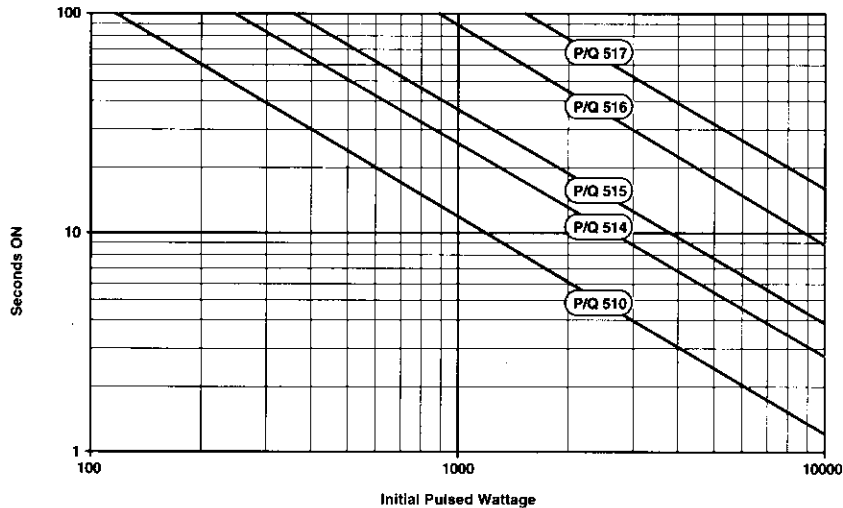


FIGURE 5 P/Q 500 Series Solenoids - Minimum ON Time Needed
For Solenoid to Reach Rated Force

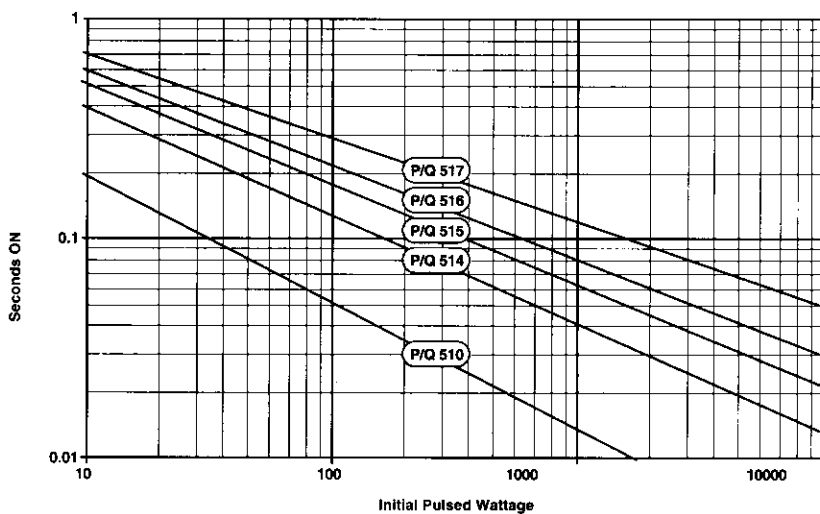


FIGURE 6 Standard Coils Available

Coils for 12, 24, 36, 48, 108 and 216 VDC are available for any wattages shown in the force curves for that size solenoid, EXCEPT for the following:

Size	12 V exceptions	24 V exceptions
P/Q 510	3800 W	
P/Q 514	3500 & 6540 W	
P/Q 515	4800 & 8600 W	
P/Q 516	4200 & 6650 W	6650 W
P/Q 517	3570 & 8170 W	8170 W

The above exceptions are not practical to manufacture, but CUSTOM coils for special wattages and voltages can be investigated by Trombetta's Engineering Department.

Trombetta P/Q500 SERIES Solenoids

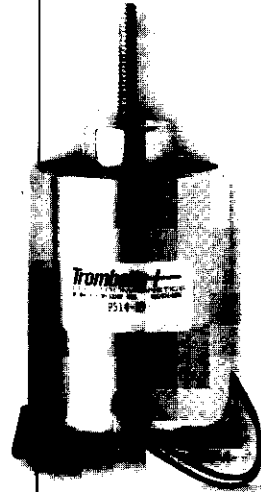


FIGURE 3 is used once your Duty Cycle is known, to ensure the solenoid will operate at a safe temperature. If the *ambient temperature* is low, more wattage can be pumped in. If the ON Time is kept to a minimum, the cycle rate can be maximized. Use this simplified equation to estimate the Average Power you plan to enter into the unit:

Average Watts = Initial Pulsed Watts times (ON Time divided by Total Time).

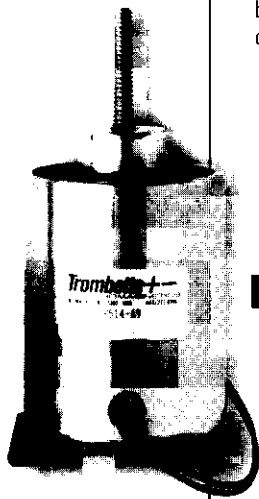
FIGURE 4 is a guide when your application has a very low Duty Cycle and a relatively long ON Time to ensure heating will not be excessive. If several rapid cycles can occur, for example during an installation test, use the total of the ON Times, when using this chart.

FIGURE 5 is used in minimizing the ON Time your control switch needs. Solenoids, being *inductors*, take time to build up their magnetic field, and then the armature can overcome the load force and begin moving. The larger the solenoid, or the lower the applied wattage, the longer the ON Time required.

FIGURE 6 shows the coil selections that are not offered in the lower voltage ranges. Due to the heavy gage magnet wire and number of layers wound, it becomes physically impractical to manufacture these specific combinations.

Trombetta+-
MOTION TECHNOLOGIES

Trombetta P/Q510 SERIES Solenoids



P/Q 510 Model

FIGURE 7 shows the maximum forces to expect for the P/Q 510 solenoids at room temperature and with full voltage applied. If your application has a very low Duty Cycle, use these forces to match the load forces. The maximum forces expected should be considered in any mounting or armature linkage designs.

FIGURE 8 shows the minimum forces to expect once the solenoid has been heated up by an elevated Ambient Temperature and from the Average Wattage that has been entered from continuous cycling. Also, the lower forces take into account lowered voltage. Low voltage can occur, for example, during engine cranking in a 12 VDC automotive application. Use these forces for higher Duty Cycle cases.

FIGURE 7 P/Q 510 Solenoids at 100% Rated Voltage & 25 °C Coil

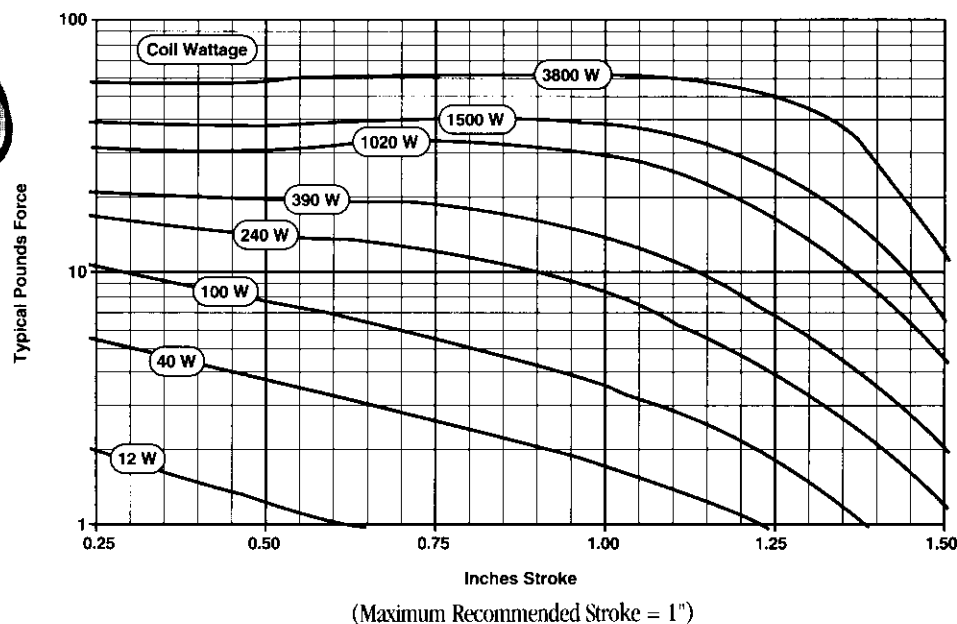
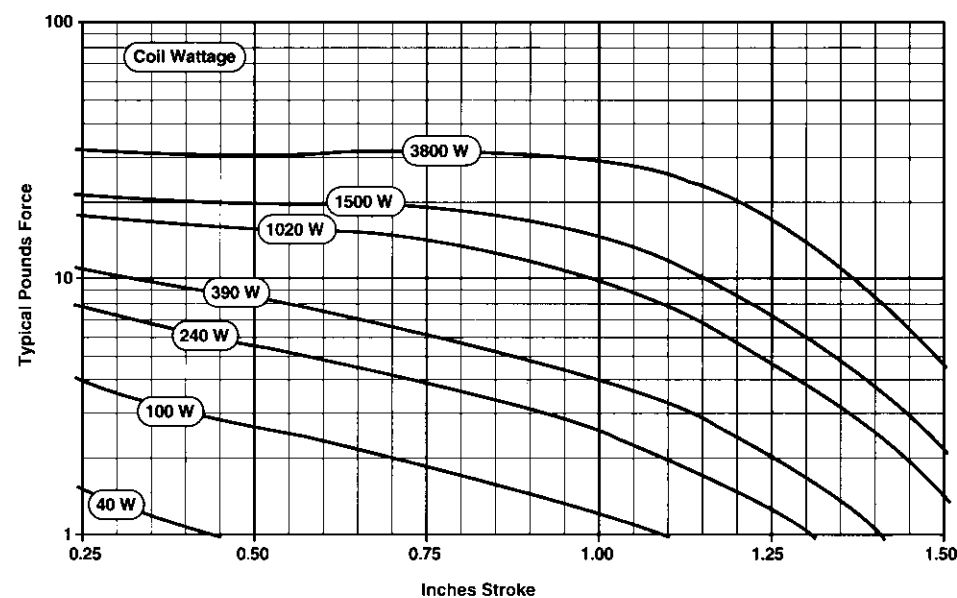


FIGURE 8 P/Q 510 Solenoids at 80% Rated Voltage & 155 °C Coil



P/Q 514 Model

FIGURE 9 shows the maximum forces to expect for the P/Q 514 solenoids at room temperature and with full voltage applied. If your application has a very low Duty Cycle, use these forces to match the load forces. The maximum forces expected should be considered in any mounting or armature linkage designs.

FIGURE 10 shows the minimum forces to expect once the solenoid has been heated up by an elevated Ambient Temperature and from the Average Wattage that has been entered from continuous cycling. Also, the lower forces take into account lowered voltage. Low voltage can occur, for example, during engine cranking in a 12 VDC automotive application. Use these forces for higher Duty Cycle cases.

FIGURE 9 P/Q 514 Solenoids at 100% Rated Voltage & 25 °C Coil

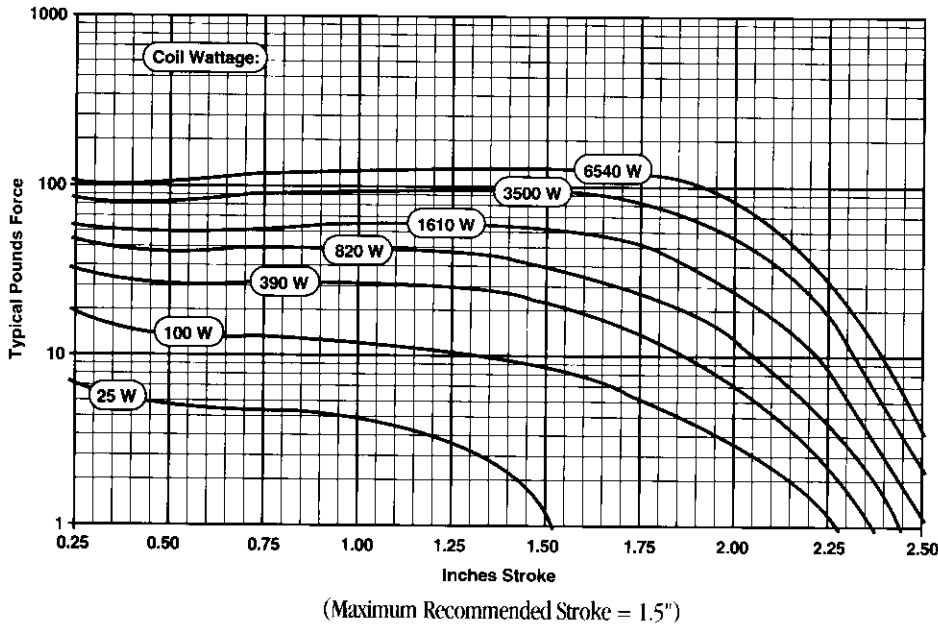
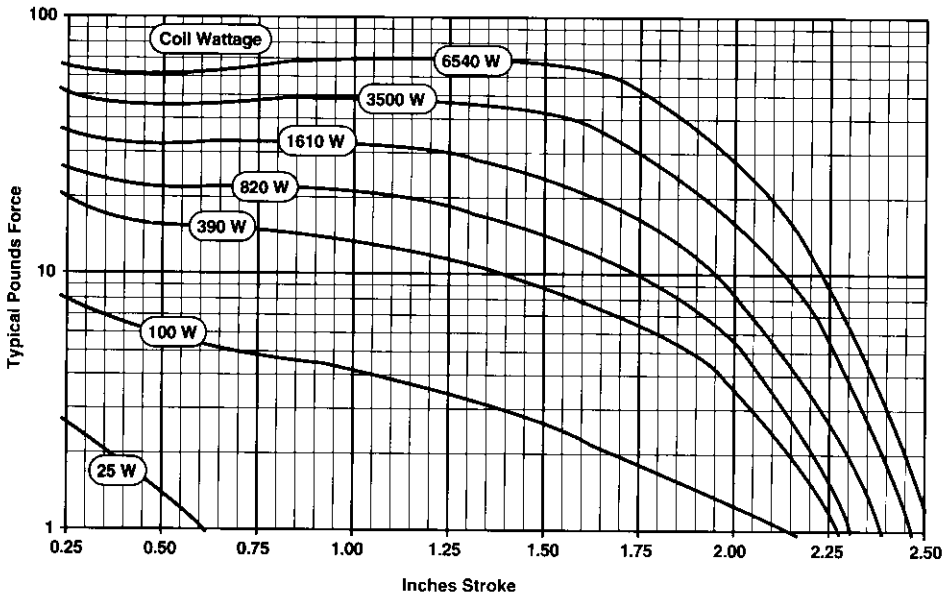
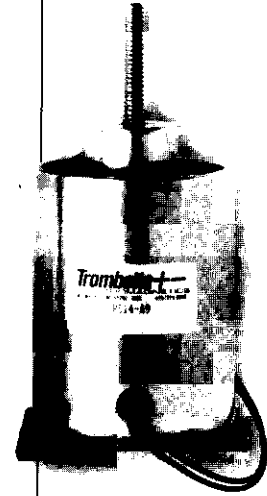


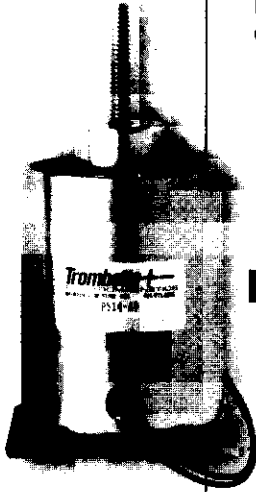
FIGURE 10 P/Q 514 Solenoids at 80% Rated Voltage & 155 °C Coil



Trombetta P/Q514 SERIES Solenoids



Trombetta P/Q515 SERIES Solenoids



P/Q 515 Model

FIGURE 11 shows the maximum forces to expect for the P/Q 515 solenoids at room temperature and with full voltage applied. If your application has a very low Duty Cycle, use these forces to match the load forces. The maximum forces expected should be considered in any mounting or armature linkage designs.

FIGURE 12 shows the minimum forces to expect once the solenoid has been heated up by an elevated Ambient Temperature and from the Average Wattage that has been entered from continuous cycling. Also, the lower forces take into account lowered voltage. Low voltage can occur, for example, during engine cranking in a 12 VDC automotive application. Use these forces for higher Duty Cycle cases.

FIGURE 11 P/Q 515 Solenoids at 100% Rated Voltage & 25 °C Coil

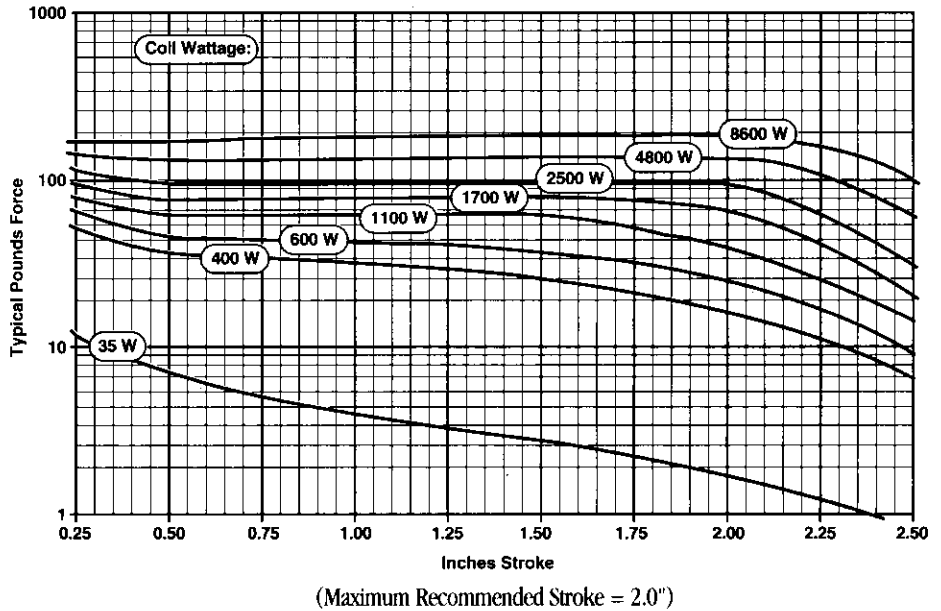
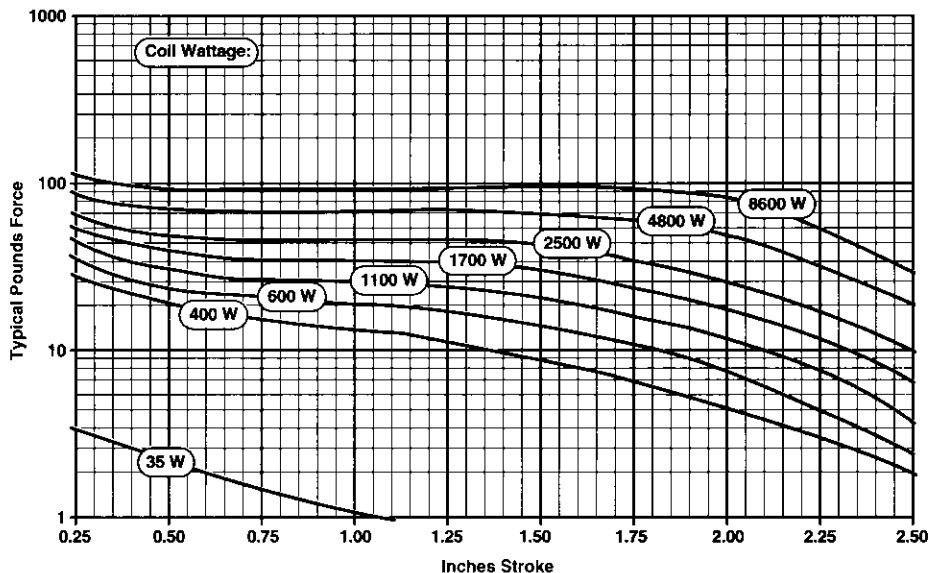


FIGURE 12 P/Q 515 Solenoids at 80% Rated Voltage & 155 °C Coil



P/Q 516 Model

FIGURE 13 shows the maximum forces to expect for the P/Q 516 solenoids at room temperature and with full voltage applied. If your application has a very low Duty Cycle, use these forces to match the load forces. The maximum forces expected should be considered in any mounting or armature linkage designs.

FIGURE 14 shows the minimum forces to expect once the solenoid has been heated up by an elevated Ambient Temperature and from the Average Wattage that has been entered from continuous cycling. Also, the lower forces take into account lowered voltage. Low voltage can occur, for example, during engine cranking in a 12 VDC automotive application. Use these forces for higher Duty Cycle cases.

Trombetta P/Q516 SERIES Solenoids

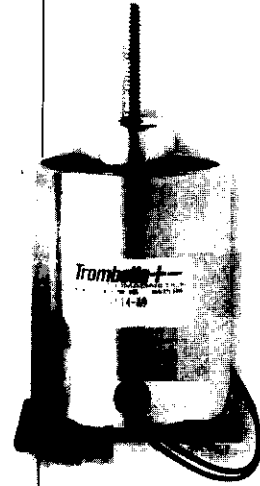


FIGURE 13 P/Q 516 Solenoids at 100% Rated Voltage & 25 °C Coil

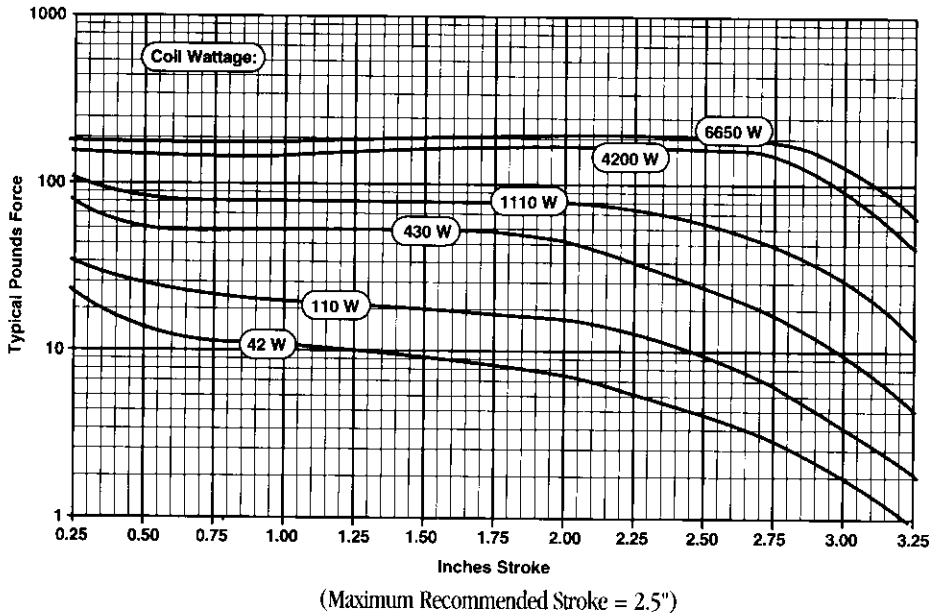
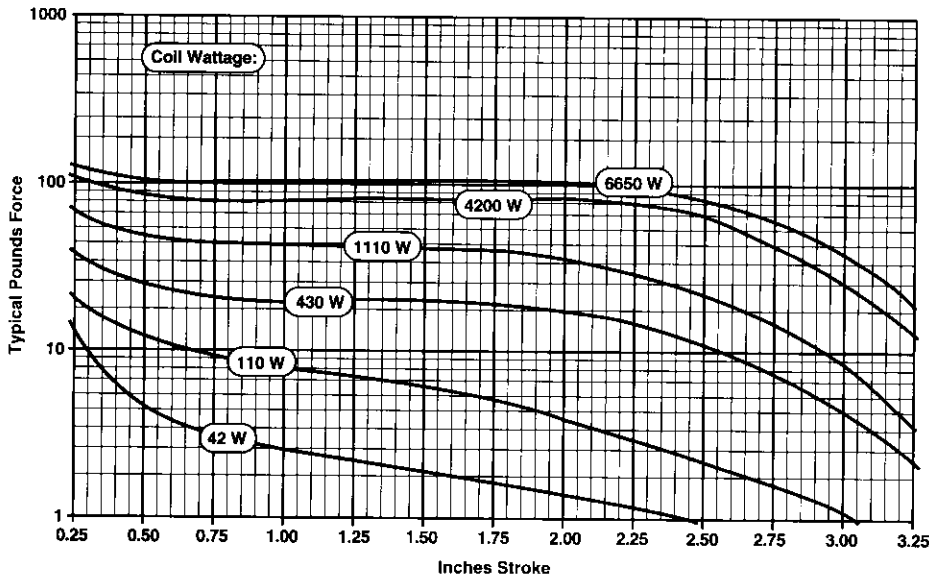


FIGURE 14 P/Q 516 Solenoids at 80% Rated Voltage & 155 °C Coil



P/Q 517 Model

FIGURE 15 shows the maximum forces to expect for the P/Q 517 solenoids at room temperature and with full voltage applied. If your application has a very low Duty Cycle, use these forces to match the load forces. The maximum forces expected should be considered in any mounting or armature linkage designs.

FIGURE 16 shows the minimum forces to expect once the solenoid has been heated up by an elevated Ambient Temperature and from the Average Wattage that has been entered from continuous cycling. Also, the lower forces take into account lowered voltage. Low voltage can occur, for example, during engine cranking in a 12 VDC automotive application. Use these forces for higher Duty Cycle cases.

FIGURE 15 P/Q 517 Solenoids at 100% Rated Voltage & 25 °C Coil

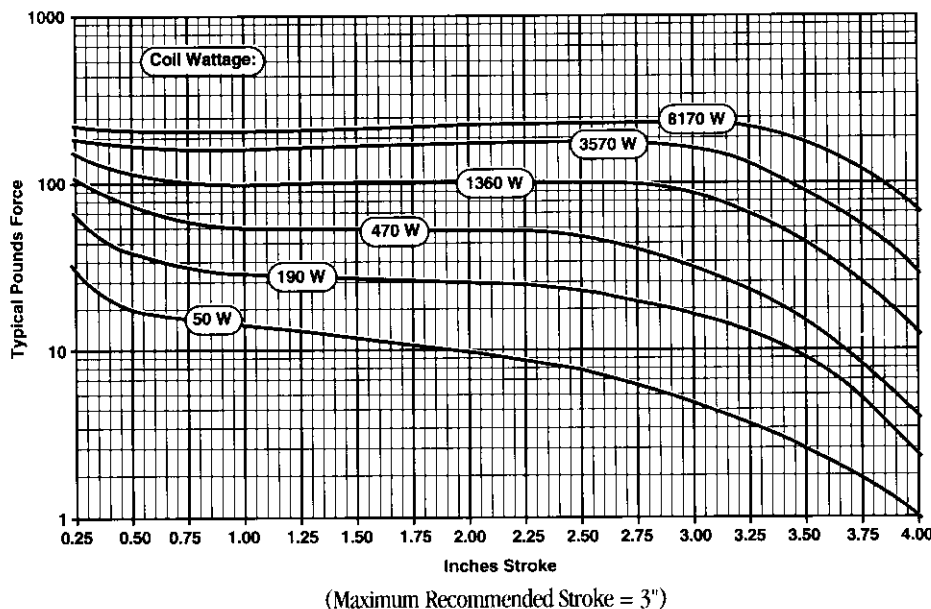
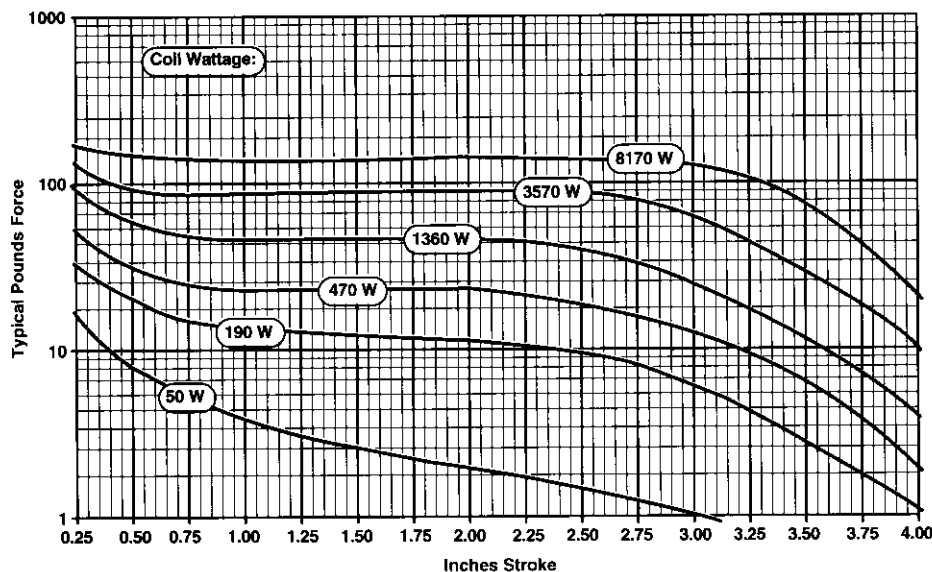
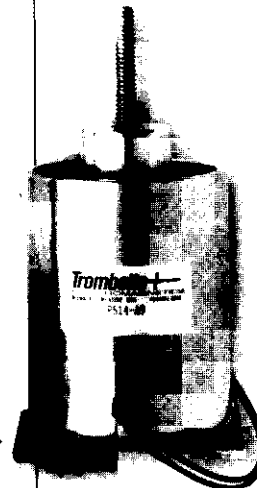


FIGURE 16 P/Q 517 Solenoids at 80% Rated Voltage & 155 °C Coil



Trombetta P/Q517 SERIES Solenoids



P/Q500 Series Options

- Various voltages, insulation classes, mountings and plungers
- Solid-state switches, spring returns
- Special surface finishes
- Protective boots

Trombetta solenoid products have been designed and manufactured in the U.S.A. since 1932.

See Trombetta first for long-lasting tough-duty solenoids to fit the toughest – or easiest – applications.



HUEGLI TECH LTD
SWITZERLAND

Tel.: +41-62-916 50 30
Fax: +41-62-916 50 35
sales@huegli-tech.com

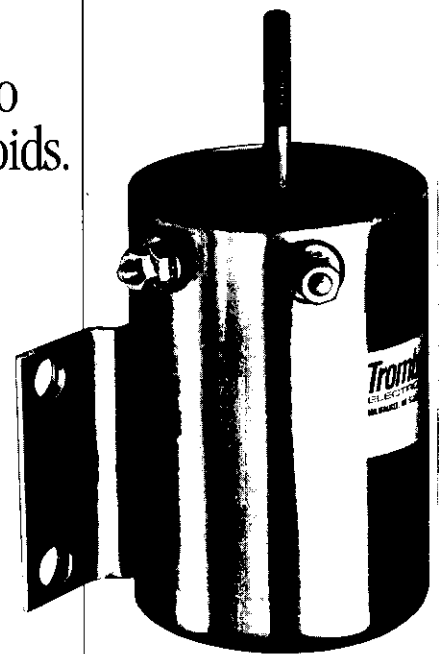
Trombetta 
MOTION TECHNOLOGIES

IN-STOCK REPLACEMENTS FOR DELCO SOLENOIDS

Replace obsolete, expensive or hard-to-get Delco solenoids with OEM approved Trombetta solenoids.

Trombetta stocks replacements for discontinued or hard to find Delco solenoids. In every case we produce a replacement that is equal or superior to the Delco model in electrical and mechanical features. Designed for form, fit and function, Trombetta replacement solenoids are preferred by original equipment manufacturers because of our reliability, availability and price.

DELCO PART #	DETROIT DIESEL PART #	TROMBETTA REPLACEMENT MODEL #	DIMENSIONS FIGURE #
1118128	23504196	P515-A57V12	1
1118191	23504197	P515-A57V24	1
1118200	-	P515-A57V64	1
1119921	-	Q515-A60V12	NOT SHOWN
001535	-	D516-A11V13	2
1119911	-	D516-A11V25	2
1119817	-	D516-A11V24	2
1119821	-	D516-A11V12	2



Trombetta Replacement
#P515-A57V12

FIGURE 1

P515-A57

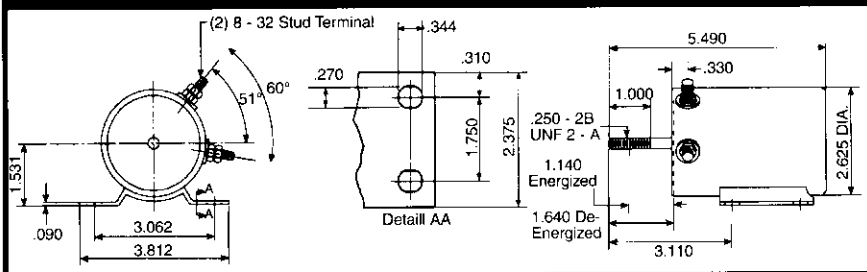
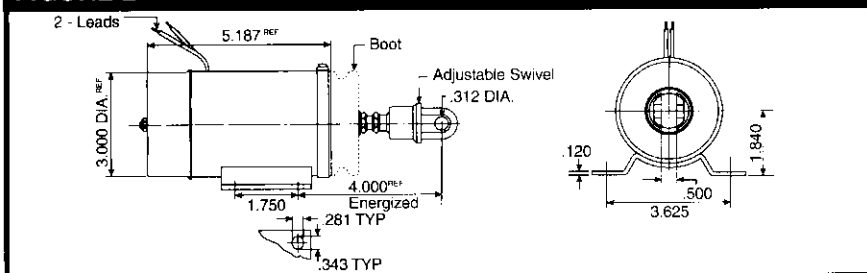


FIGURE 2

D516-ALL



OTHER REPLACEMENT SOLENOIDS AVAILABLE:

- D610 series solenoids replace Synchro Start 1502, 1504 and 1753 solenoids.
- P610 series solenoids replace Synchro Start 1502ES, 1504ES and 1753ES solenoids.
- D513 series solenoids replace Synchro Start 2001, 1751, and 2003 solenoids.
- P613 series solenoids replace Synchro Start 2001ES, 1751ES, 2003ES and D series solenoids.
- D515 series solenoids replace Synchro Start 2370 solenoids.
- P600 series solenoids replace Synchro Start 1502, 1504, 1751 and 2003 solenoids when used with Trombetta modules.
- Low profile governor mounted kits provide efficient shutdown for engines with Bosch RSV governors.
- Q600 series solenoids provide push action up to 20 pounds at 1-1/2" stroke.
- "Qwick-Kits" are available for shutdown of many popular engines.
- P/Q 500 series and D500 series solenoids (push and pull) are available for applications requiring longer strokes and /or higher forces.

Trombetta solenoid products have been designed and manufactured in the U.S.A. since 1932.

See Trombetta first for long-lasting tough-duty solenoids to fit the toughest – or easiest – applications.



HUEGLI TECH LTD
SWITZERLAND

Tel.: +41-62-916 50 30
Fax: +41-62-916 50 35
sales@huegli-tech.com

Trombetta + -
ELECTROMAGNETICS